On the 28th there was a deep depression central near latitude 48° N., longitude 35° W., which was apparently surrounded by moderate winds only. This increased in intensity during its easterly movement, and on the 29th winds of hurricane force were encountered in a limited area near the 50th parallel, between the 20th and 30th meridians. Storm log:

British S. S. *Michigan:*

Gale began on the 28th, wind WSW. Lowest barometer 29.29 inches at 11 p. m. on the 28th, wind WSW. 11, in latitude 50° 32′ N., longitude 27° 40′ W. End on the 30th, wind W. Highest force of wind 12; shifts SW.–WSW.–W.

On the 30th this LOW was over the British Islands and had begun to fill in. On the 30th there was a second disturbance central near latitude 45° N., longitude 40° W., and vessels in the southerly quadrants reported westerly gales of force 8–10. Storm log:

German S. S. *Albert Ballin:*

Gale began on the 29th, wind SSE. Lowest barometer 29.38 inches at 2 a. m. on the 30th, wind SW. 8, in latitude 44° 10′ N., longitude 37° 32′ W. End on the 30th, wind NW. Highest force of wind 11, W.; shifts SW.–WSW.–W.

SOUTH ATLANTIC OCEAN

By ALBERT J. MCCURDY, Jr.

Weather reports received from vessels that traversed the southern shipping routes in April, 1924, indicate that stormy conditions prevailed off the South American coast in the first and last decades of the month.

During the first of these periods three vessels encountered fresh to whole gales. These were the German S. S. *Bayern*, and the British steamships *Damerara* and *Gloria de Larrinaga.*

The *Damerara*, Capt. T. A. Hill, proceeding from Brazil toward Liverpool, on the 1st encountered a westerly gale accompanied by heavy rain squalls. Mr. A. Hambly, fifth officer, reports that the lowest pressure observed was 29.56 inches, this occurring at 2 p. m., in the River Plate. The wind at this time was WNW., force 8, thence shifted to W. by S., and increased to a strong gale. This gale ended on the 2d, wind W. by S. Highest force of wind 9.

On the 2d the *Bayern*, Capt. H. Molchin, proceeding from Hamburg to Buenos Aires, encountered the same gale while in 35° S., 54° W., reporting conditions similar to those experienced by the *Damerara*. Mr. K. Schubert, observer, states that the lowest barometer, 29.52 inches, was recorded at 4 a. m., on the 2d. The wind at this time was W. by S., force 11.

On the same date the *Gloria de Larrinaga*, Capt. J. J. Doyle, proceeding from Cardiff to Buenos Aires, came within its influence, experiencing west-northwesterly winds, force 8, accompanied by high seas. Mr. F. J. O'Hara, 2d officer, reported the lowest observed pressure, 29.67 inches, occurring in 32° S., 51° W. This gale ended on the 3d, wind SW. by S.

The Danish S. S. *Nevada*, Capt. K. R. Fischer, proceeding from Buenos Aires to Newport News, on April 26 encountered a westerly gale accompanied by heavy squalls and rain. Mr. K. K. Kjolhede, observer, states that the lowest pressure observed was 29.96 inches (uncorrected), occurring at 10 a. m., in 29° 16′ S., 47° 07′ W. The wind at this time was W., force 10. Similar conditions continued throughout the 27th.

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NORTH PACIFIC OCEAN

By WILLIS E. HURD

During April there was a considerable decrease in storm intensity on the North Pacific over that of the preceding month. Many liners reported no storm winds whatever, while the majority of those vessels recording gales observed no forces exceeding 9. Occasionally a force of 10 indicated some increase in cyclonic or anticyclonic activity, and on one date, the 29th, a full hurricane wind of several hours' duration was encountered.

A considerable amount of precipitation occurred over some areas, noticeable in the Hawaiian and eastern tropical regions, and snow and sleet fell in higher latitudes on several scattered days throughout the month. Along the coast of the United States from San Francisco northward rainfall was deficient.

Apart from the prevalence of the Aleutian cyclone over the Gulf of Alaska, no cyclonic storms of much importance appeared in American coast waters. From the 14th to the 17th moderate gales occurred along these shores between the 40th parallel and Cape San Lucas, due to the considerable gradient between the eastern North Pacific high pressure area and a cyclone then central over the Western States.

On the 20th low pressure began forming on the eastern boundary of the HIGH, or near 35° N., 135° W., and on the 21st and 22d moved in upon the continent. This condition resulted in moderate to strong gales along the coasts of Washington, Oregon, and northern California from the 22d to the 24th. The maximum force recorded was 10 from the north on the 22d, experienced by the Norwegian S. S. *Ranenfjord* while steaming up the coast in latitude 40° 58′ N., longitude 124° 40′ W.

To the southward of Cape San Lucas the winds were for the most part light during April, calms and variables being frequent, but northwesterly winds being prevalent. Over and to the southward of the Gulf of Tehuantepec north to northwest gales of forces 8 to 9 were reported on the 17th, 18th, and 19th, accompanied by a slight fall in pressure.

The northeast trades prevailed in the Hawaiian region. Some slight depressions appeared in this area, and that of the 6th gave Honolulu a maximum wind velocity for five minutes of 48 miles an hour from the southwest, this breaking previous records for the month. This was the wettest April on record here, as well as the second cloudiest. On the 21st and 22d another depression entered the Hawaiian area. It, however, gave very little wind, but did produce an extraordinary downpour of rain which amounted to 7.99 inches at Honolulu during the two days. The depression had moved northward into the sphere of the Aleutian LOW by the 25th.

In the Far East a few continental LOWS entered upon the Pacific. One on the 1st to 3d from northern Japan caused moderate gales of forces 7 to 9 which were experienced by vessels to the eastward of the archipelago. A depression which left China near the 30th parallel on the 5th also caused moderate gales on that and the following day over neighboring waters and to the southward of Japan. No high winds from depressions of later date in this general region have been reported.

The Aleutian LOW, as a fluctuating storm area, was well defined almost throughout the month, with its center of activity lying east of the Alaska Peninsula

during an irregularly distributed two-thirds of the time and mostly over the northern part of the Gulf. For the other third of the period the center was over Bering Sea. Lows descended into western Canada from this region on the 1st, 5th, 11th, 15th, 17th, 20th, and 27th. The lowest observed land-station pressure for the month was 28.86 inches, at Kodiak on the 26th. The minimum recorded by a vessel at sea was 28.92 inches, on board the Japanese S. S. *Alaska Maru* in 44° 21′ N., 147° 13′ W., on the 29th. On the same date the American S. S. *Oduna*, in latitude 55° 51′ N., longitude 145° W., had a barometer reading of 28.97. These instances indicate the great extent of the area covered by very low pressure.

The eastern North Pacific HIGH was best established during the first 20 days of April. Thereafter it was considerably broken up, during the last five days largely by the southward swing of the Aleutian cyclone from the Gulf of Alaska.

Pressure at Dutch Harbor averaged 0.16 inch below normal during the first half of the month and 0.19 inch above during the last half. For the month (29 days) the average pressure, based on p. m. observations, was 29.86 inches, or 0.01 inch above normal. The highest pressure, 30.40, was recorded on the 17th and 20th; the lowest, 29.16, on the 3d. The average pressure at Midway Island was 30.11 inches, or 0.02 inch below normal. The highest reading, 30.30, was recorded on the 26th; the lowest, 29.86, on the 30th. At Honolulu pressure was continuously below normal from the 3d to the 23d, the average daily departure (p. m. observations) being −0.09 inch. The average pressure for the month was 30.01 inches, or 0.05 inch below normal. The highest reading, 30.14, was recorded on the 29th; the lowest, 29.85, on the 6th.

Aside from the storm conditions previously noticed, it is observed that a greater part of the northern steamship routes had more gales on the 1st, 2d, and 3d than on any other day or period of days during the month. These gales did not as a rule exceed 8 or 9 in force, but they were accompanied by frequent snow squalls in higher latitudes and raised high seas both east and west of the 180th meridian.

The American S. S. *West Cayote*, Capt. L. Johnson, bound from Portland toward Yokohama, encountered rougher weather probably than any other vessel making a trans-Pacific voyage in April. From the 1st to the 10th, or during most of the westward passage, she passed through a succession of westerly to northerly gales, which did not, however, exceed 9 in force. Her lowest observed pressure was 29.01 inches in 52° 17′ N., 163° 05′ W., on the 3d.

There was little storm activity reported for the greater body of the ocean from the 10th to the 25th. The maximum number of stormy days occurred over and to the southward of the Gulf of Alaska, as might be inferred from the greater prevalence there of the Aleutian cyclone, especially during the last week. This cyclone reached its peak of severity on the 29th, at which time the S. S. *Alaska Maru* experienced her lowest pressure, as already noted, and also sustained a west-southwesterly wind of hurricane force from 4 p. m. until midnight, near 44° N., 147° W. This was the only gale of the month, so far as known, to exceed 10 in force.

Fog, especially in east longitudes, along the sailing routes, showed a decided increase in percentage over that of March. It was observed along practically the entire China coast on the 10th, and in the neighborhood of Shanghai continued until the 16th. Fog also occurred on several days along the American coast, being noted from Puget Sound southward to near Acapulco.

DETAILS OF THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS

By ALFRED J. HENRY

A warm dry month on the Pacific coast, also warm in the great interior valleys; elsewhere the temperature was close to the normal. More than the normal precipitation in Atlantic coast States and in some of the Gulf States, also in the upper Mississippi Valley. See the inset on Chart IV. The usual details follow.

CYCLONES AND ANTICYCLONES

By W. P. DAY

The movement of the low-pressure areas during the month of April, 1924, was even more erratic than usual for a month which has long been characterized by halting, undecided, and abnormal storm movements. One storm, which developed over Nevada on the 22d, after moving eastward in the normal manner to northwestern Missouri, turned northward and northwestward and finally dissipated over northeastern Montana. In this case the air flow within the LOW was diverted by the intrusion to the east of a large area of high barometric pressure from the Hudson Bay region. A large number of the low-pressure areas had the so-called trough formation in which the point of lowest barometer is a rather indefinite and shifting phenomenon. One of the most severe storms of the month on the Atlantic coast suddenly developed in the southern end of one of these troughs during the 6th in the vicinity of the Virginia Capes, moved northeast to New England, and thence eastward into the Atlantic.

FREE-AIR SUMMARY

By V. E. JAKL, Meteorologist

The average free-air conditions over that portion of the country represented by aerological stations were practically normal in all respects. This is evidenced by Tables 1 and 2, from which it will be noted that the departures from the normal were slight for all elements, although there were a few exceptions. Such exceptions were plausibly accidental rather than real, owing to the circumstance of observation. As kite flights are dependent upon suitable wind and weather, observations by means of them can not be carried on even to moderate altidudes with the regularity characteristic of surface meteorological work. The scattered departures of apparently decided value noted in Tables 1 and 2 need not therefore merit other than passing notice.

Such slight temperature departures as recorded in the general averages are in close agreement geographically—also in character and amount—with the surface departures that appear on Chart III. Inferentially, the causes contributing to the observed average temperatures on the ground extended aloft to the upper limit of observation. For example, the principal periods of cool weather east of the Rocky Mountains, in so far as they are revealed in aerological records, occurred on the 1st–2d, 9th–10th, and 17th–18th. Kite flights made at stations